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Published in:

EU-SPRI Conference Lund 2016

Publication date:

2016

Document Version

Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):

Larsen, T. H., & Hansen, U. E. (2016). Vertical and horizontal dimensions of upgrading in global value chains: insights from the establishment of local manufacturing of wind turbine components in South Africa. In *EU-SPRI Conference Lund 2016 : Book of abstracts* (pp. 205-207)

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Vertical and horizontal dimensions of upgrading in global value chains: insights from the establishment of local manufacturing of wind turbine components in South Africa

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KEYWORDS: Global value chains, Industrial policy, Wind turbine industry, South Africa, Upgrading

1. Introduction

An inherent feature of globalization is the increasing relocation of production activities across developed and developing countries. The literature on global value chains (GVC) addresses how this restructuring of production is organized focusing specifically on implications for developing country firms (Gereffi et al., 2005). The concept of upgrading is used to describe how competitiveness of developing country firms may be improved by capturing a higher share of value-added from their insertion in GVCs (Humphrey and Schmitz, 2002). The predominant orientation in the literature is to focus on the vertical dimension that influences the prospects for the insertion and upgrading of local suppliers. The vertical dimension includes the relationships between buyers and suppliers, the movement of goods and services and the flow of material resources along the value chain. In particular, research on upgrading in GVCs focus on the key role of lead firms in creating the conditions for upgrading (Kaplinsky 2000).

This focus on the vertical dimension has been criticized for its lack of attention to the horizontal dimension that could be of equal importance in creating the conditions for the insertion and upgrading of local suppliers in GVCs (Bolwig et al., 2010). The horizontal dimension includes such things as the local institutional structure, economic and political framework conditions, physical infrastructure etc. While these chain external conditions may have significant influence on value-chain governance and processes of upgrading, a thorough understanding of the interplay between the vertical and horizontal dimensions of upgrading is currently lacking.

This paper contributes to addressing this knowledge gap by exploring the role of industrial policy as an important horizontal dimension influencing the insertion and upgrading of local suppliers in GVCs. The main research question guiding the paper is: what is the relative importance of (internal) vertical value chain dynamics and (external) horizontal industrial policies in the insertion and upgrading of local suppliers in GVCs? This question is analysed empirically in relation to the establishment of local production of key wind turbine components in South Africa.

2. Analytical framework and research methods

To address the vertical dimension of upgrading, this paper draws on the GVC literature, which posits that opportunities for upgrading depend upon the governance structure of the chain (Humphrey & Schmitz, 2002). The governance structure varies across industries according to the complexity of transactions, the ability to codify transactions and the capabilities of lead firms and suppliers (Gereffi et al., 2005). Therefore, variability in governance structure conditions the prospects for upgrading (Humphrey & Schmitz, 2002). The literature has generally established that product and process upgrading is likely to occur in captive value chains while functional upgrading is more likely to take place in relational value chains (Guiliani et al., 2005).

As a way of addressing the horizontal dimension of upgrading we draw on the literature on infant industries, which focuses on the active role of industrial policy in orchestrating upgrading (Amsden, 1989; Kim, 1997; Wade, 1998; Mathews and Cho, 1999). This literature draws particularly on the experience from the so-called 'Asian miracles' during the 1990s, which were generally shown to require a highly committed state apparatus closely involved in industry development (Angel and Rock, 2009). We draw specifically on the framework proposed by Schmitz (2007) to address the ability of industrial policies to support local industries in overcoming marketing and technology-related gaps.

These analytical perspectives are combined in an explorative way to analyze the establishment of local production of key wind turbine components in South Africa. Data has been collected through nine semi-structured interviews with key stakeholders within the government of South Africa, the domestic wind turbine industry and the global industry. In addition, data from a number of documentary sources such as policy documents, industry reports and news articles was applied to add depth to the analysis.

3. Key findings

3.1. Vertical dimension

Lead firms within the global wind turbine industry are increasingly focusing on key activities in the value chain and leaving the manufacturing of components as a "window of opportunity" for external suppliers. However, lead firms have high concerns over the quality of components and rely on a small group of established suppliers. The industry is witnessing increasing global integration through market-seeking FDI, which results in regional production hubs emerging in places of significant demand. Historically, the provision of a large and stable long-term demand has been critical for attracting lead firms to localize production.

The governance structure in the industry varies across components. The production of towers is most often offshored due to its bulky nature and the lower technological requirements for production. Blades require significant technological capacity and lead firms rely on either in-house production or external supply from a single, globally-operating supplier. Nacelle components such as the gearbox, generator and converter are likewise produced in-house or outsourced to a small group of trusted suppliers. However, some nacelle components are beginning to be sourced from China due to significant cost advantages.

3.2. Horizontal dimension

The South African government has identified the renewable energy sector as a strategic area promising upgrading of domestic capabilities. The aim is to establish South Africa as a regional production hub. The government has planned to expand renewable energy supply by almost 10,000 MW of wind power by 2030 through a phased procurement program initiated in 2011. The first pilot project was constructed as late as in 2007 and the procurement program caused an expansion from practically zero to almost 600 MW of installed capacity from 2013 to 2014. The main industrial policy component of the program is the inclusion of local content requirements that are intended to increase gradually. Other criteria that were applied to evaluate bids include local ownership, enterprise development and job creation. Towers and blades were identified as the components most relevant for local production. Results from the third and latest procurement round revealed how as much as 75% local content was secured through towers and the balance of plant for the turbines. The South African wind turbine industry faces a wide technology gap but a relatively narrow marketing gap. As such, encouraging licensing and joint ventures would be the most optimal industrial policy in order to acquire technology. However, for blades and nacelle components the marketing gap is higher because of lead firms' reliance on suppliers with proven track records and thus attracting FDI becomes relevant.

4. Discussion

The findings show that one local and one foreign company have initiated local production of towers. This can be explained by the local content requirements adopted by the government and the tendency of lead firms to outsource the production of this component due the ease of codifying transactions. The local firm has acquired access to the technology through a technology partnership with a lead firm, but the modular governance structure within towers does not encourage further upgrading. However, the narrow marketing gap within towers does suggest that a policy of acquiring technology through licensing and joint ventures would be most optimal and, hence, the industrial policy does follow this prescription.

Concerning blades there has only been one local attempt at producing such components. However, the local company did not manage to achieve the necessary certification for its technology and was liquidated. This example reflects the high complexity of transactions of key components. Further, since South Africa is facing wide technology and marketing gaps when it comes to blades, attracting FDI is crucial. However, the demand in the local market is insufficient to attract the leading supplier of blades to localize production in South Africa. While the lead firm was close to starting construction of a blades factory, these plans were put on hold due to insecure political signals regarding the future allocations of wind power.

For nacelle components there have been no attempts at local manufacturing. This is due to high transaction complexity and insufficient market. Also, for the more easily codified nacelle components, such as power converters and transformers, South Africa does not present a cost-competitive alternative to Chinese suppliers. This could have presented an opportunity to enter into captive governance structures, which would potentially facilitate process and product upgrading.

The findings show that the horizontal dimension is highly important in accounting for the establishment of local tower production. This is clear from the way industrial policy has created demand through local content requirements. At the same time, the vertical dimension reveals how this component is often outsourced by lead firms due the ease of codifying it. Hence, a local firm possessing relatively high capabilities has been able to initiate production of towers. For both blades and nacelle components the vertical dimension explains the absence of local production. The high complexity of transactions coupled with a low ability to codify

transactions constitutes an extremely high entry barrier for new entrants. Nevertheless, the horizontal dimension show how the industrial policy nearly succeeded in attracting a lead firm within blades to set up local production. However, despite the inclusion of local content requirements, the rather large demand in South Africa does not suffice to attract localization of the most strategic components.

Hence, the findings from this paper argue for the importance of considering both vertical and horizontal dimensions when assessing the emergence and/or absence of local production as an initial step for forming globally competitive industries.